



Interconnection Policy Panel
Discussion Paper

ISSUE OVERVIEW

The electric system is an integrated network of generation, transmission, and distribution facilities working together to provide reliable electric service to consumers. An electric system operator may be responsible to control transmission, distribution or both types of facilities as it fulfills its role to balance supply and demand. Therefore, the electric operators have developed interconnection processes to manage requests for interconnection of generation to their grids. These processes are intended to ensure that connections to power lines are safe, that the reliability of their grid is maintained, and that generators provide for the operator to monitor their operation. Both public and private utilities provide interconnection approval processes for the low voltage distribution grids that they own and operate. As the number of requests to interconnect to the grids increase, the amount of complexity of managing the requests also increases. Many renewable generators seeking to connect to the utility operated distribution grid are expressing frustration and pointing to how interconnection and approval process result in increased costs, delays and project failures.

BACKGROUND

Classification of Local Energy Resources

For the purposes of this panel discussion, there are three categories of local energy generation resources, also known as distributed generation (DG). The first type is a generator that is located on the customer-side of the meter and produces electricity to offset the customer's load. This type of generator is located at a customer site and is typically less than 1 MW. The second type is a generator located near a load center. This type of generator is usually less than 5MW and typically 1-2 MW, but may be as large as 20 MW. The third type of local energy resource is a generator that is located outside of a load center, typically in rural areas where more land is available. This type of generator

tends to be ground-mounted and varies in size up to 20 MW. These three categories of generators have different types of impacts on the electrical grid and thus, may warrant different interconnection processes.

Current Federal and State Interconnection Procedures for Small Generators

Table 1 below lists the different interconnection procedures available to generators. These procedures are in Rule 21, the Wholesale Distribution (Access) Tariffs (WDAT/WDT), and the CAISO Generator Interconnection Procedures (GIP). The IOUs as well as the CAISO have utilized the Small Generator Interconnection Procedures (SGIP), the Large Generator Interconnection Procedures (LGIP), and the GIP.

Table 1: State and Federal Interconnection Processes

Process	Project Size Limit	Jurisdiction	Grid	Status	Notes
Rule 21	None	CPUC or Publicly Owned Utility	Distribution or Transmission ¹	In use today	Typically used with customer programs or qualifying facilities
GIP	None	FERC	Transmission	In use today	Combines SGIP and LGIP into one cluster study
WDT (PG&E) or WDAT (SCE and SDG&E)	None	FERC	Distribution	In use today, PG&E and SCE recently changed the study process from a serial process to a cluster study process.	FERC approved changes in April 2011
SGIP	≤ 20 MW	FERC	Transmission	No longer available	Reformed from serial to cluster study process in 2010
LGIP	>20 MW	FERC	Transmission	No longer available, merged with SGIP into GIP	Reformed from serial to cluster study process in 2009

In addition, these procedures include an expedited review process for small projects which have simple interconnection requirements. These expedited review processes

¹ Rule 21 has not been used for interconnection to the transmission system.

consist of various screens that help determine if a project can be interconnected without the need for detailed studies.

Table 2: Expedited Interconnection Processes in Rule 21, WDAT, CAISO GIP

Interconnection Process	Expedited Review	Project Size Limit	Screens	Timing
Rule 21	Initial Review, Simplified Interconnection	None	Must pass 8 Screens ²	< 1 month
WDAT	Fast Track	2 MW (SCE and SDG&E) 5 MW (PG&E)	Must pass 10 screens, ³ which were derived from Rule 21	≈ 1 month
CAISO GIP	Fast Track	5 MW	Must pass 9 screens ⁴	≈ 1 month

Investor-owned utilities (IOUs) are using both Rule 21 and WDAT for projects interconnecting to the distribution system

Figure 1 below shows the interconnection process utilized for each DG program. Historically, Rule 21 was created to interconnect qualifying facilities (QFs) since no interconnection standards existed at that time. QFs were created under the Public Utility Regulatory Policies Act (PURPA) of 1978 and are either renewable or cogeneration facilities. Today, Rule 21 is used to interconnect generators participating in customer programs that consume their generation onsite and will be used for new QFs.

² See <http://www.energy.ca.gov/distgen/interconnection/application.html>

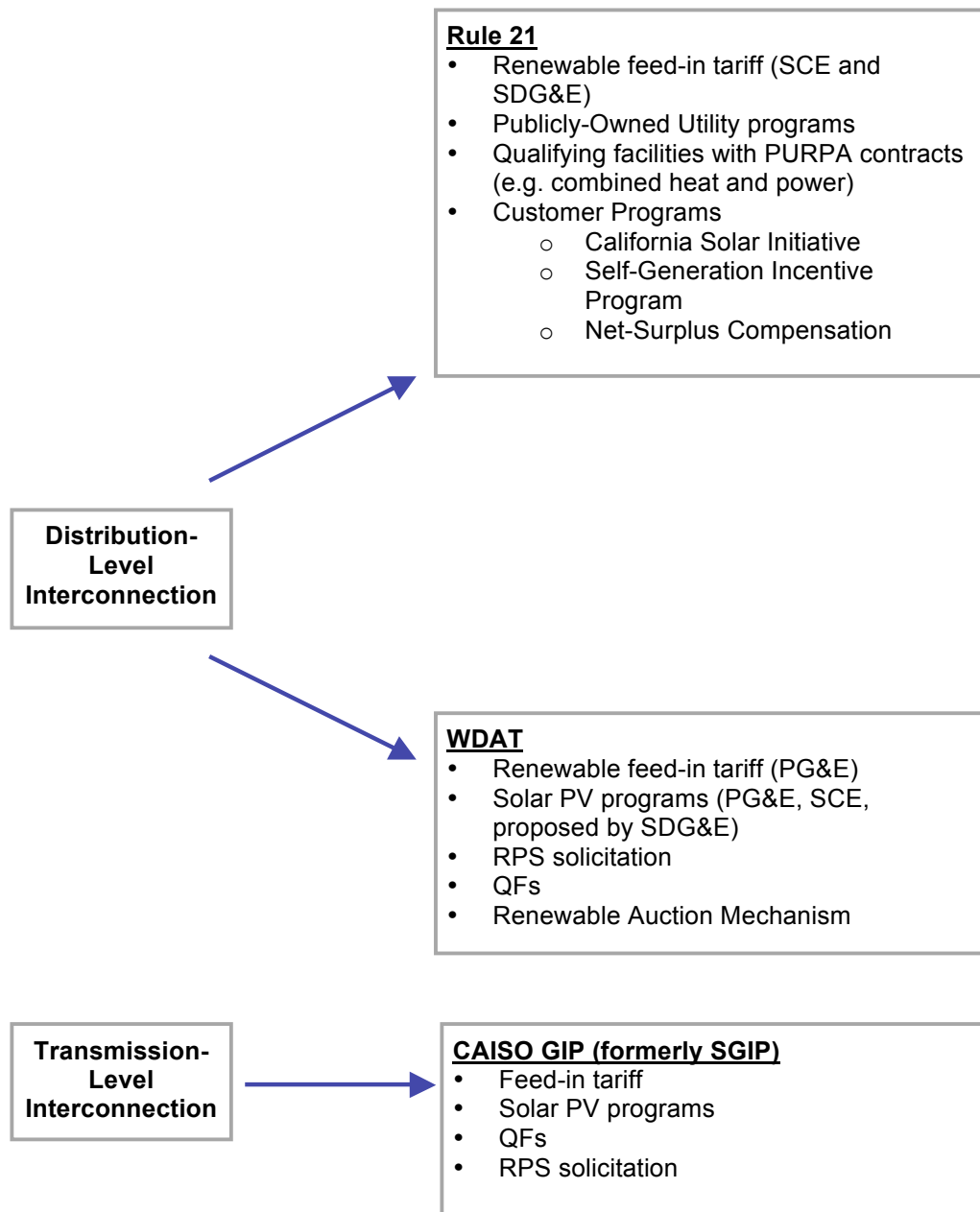
³ See Section 2 on pages 6-8:

http://www.sce.com/NR/sc3/tm2/RPA/Reg_Info_Ctr/OpenAccess/WDAT/attachment_g.pdf.

⁴ CAISO revised the Fast Track through the SGIP stakeholder process. CAISO raised the project limit from 2 MW to 5 MW and removed the 10th screen, which did not allow a project to proceed through the fast track if it triggered any grid connection upgrades.

FERC established federal interconnection standards for small generators in 2005⁵. The IOUs are using the federal interconnection standards for most projects participating in the RPS.

Figure 1: Interconnection Procedures for Projects 20 MW and Smaller



⁵ FERC Order 2006: <http://www.ferc.gov/EventCalendar/Files/20050512110357-order2006.pdf>

Summary of past and current interconnection reforms

The CAISO has reformed LGIP and SGIP, creating one cluster study process called the Generator Interconnection Procedures (GIP)

In 2009, the CAISO reformed the Large Generator Interconnection Procedures (LGIP) for projects seeking interconnection to the transmission system. This reform process changed the serial study process into a cluster study process in order to alleviate the study backlog and to create a more efficient study process. In April 2010, the CAISO initiated a stakeholder process to reform SGIP and LGIP.⁶ The CAISO concluded that one cluster study process that would study the small and large generators together was needed to relieve the backlog and to study the small generators more efficiently. In December 2010, FERC approved the CAISO's revised GIP. See Table 1 above for a comparison of LGIP, SGIP, WDAT, and GIP.

The revised GIP:

- Combines the large and small generators into one cluster study process
 - Total study period of 14 months, two month increase for small generators
- Revises study fee amounts and payment schedule
- Creates an independent study process, similar to the former serial process, for projects that are electrically independent and that are far along in the project development process
- Amends the Fast Track process
 - Increases project size limit from 2 MW to 5 MW
 - Reduced screens from ten to six
 - Eliminates the tenth screen, which prohibited construction of new facilities to accommodate interconnection of the generator

⁶ <http://www.caiso.com/275e/275ed48c685e0.html>

PG&E and SCE largely adopted these changes in their WDATs, which FERC approved in April 2011.

The CPUC has reconvened the Rule 21 Working Group, which had not met since 2008.

The intent of the Rule 21 Working Group is to build consensus among the CPUC, IOUs, generators, and advocates for Rule 21 reforms to meet the technical needs and policy goals of interconnecting distributed generation. The Rule 21 Working Group succeeded at this goal in its past work, making California's Rule 21 a national model tariff establishing metering and operating standards for interconnecting distributed generation resources that are serving onsite load or net-metered. Following three years of extensive change in the statutory, technological, and generator context, however, Rule 21 is widely agreed to be in need of reconsideration.

CPUC staff held a kickoff meeting in April 2011 to initiate discussion of the issues emerging under Rule 21 that may be hindering the achievement of California's distributed generation goals. Below are examples of such issues that CPUC has identified:

- Need for transparency in terms of processing, queue information, and customer application information;
- Need for review and potential reconsideration of technical screens within Rule 21 to ensure that the appropriate issues are being studied;
- Need for articulation of cost allocation methodology where network upgrades are required;
- Need for review of utility tariff consistency with each other and with state law;
- Need for additional standard interconnection agreements to accommodate the different types of distributed generation projects anticipated to come online.

PANELISTS' PERSPECTIVE

The remainder of this issues paper is a summary of responses to questions provided to the panelists within the context of 1) classification of three categories of local energy resources; 2) a set of general objectives regarding DG interconnection; and 3) more

specifically, their unique objectives based upon their respective business models. Responses to the questions have been grouped into two general categories: Challenges and Promising Solutions.

Panelists:

- Stephen Franz, Sacramento Municipal Utility District (SMUD)
- Jaclyn Marks, California Public Utilities Commission (CPUC)⁷
- Craig Lewis, Clean Coalition
- Kevin Fox, Interstate Renewable Energy Council (IREC)
- William Chung, Pacific Gas and Electric (PG&E) Generation Interconnection Services
- Freeman Hall, Solar Electric Solutions (SES)

Areas of Agreement on General Objectives

Stakeholders generally agree on a set of common objectives regarding Local Energy Resources/DG DG interconnection. They include:

- Make interconnection of DG as simple and inexpensive as possible
- Ensure the safety, reliability, and service quality of grid operations
- Balance developer needs and ratepayer impacts
- Ensure fair and equitable treatment of all applicants
- Create uniform rules throughout California
- Provide transparent requirements, procedures, timelines and agreements to make the interconnection process as predictable and timely as possible
- Make rules technology neutral, except when differences are fully justified

Objectives specific to each Panelist

Panelists also provided unique objectives based on their particular business models:

⁷ The comments provided represent the views of Jaclyn Marks and not necessarily the views of the CPUC.

- SMUD’s interconnection experience is mostly with customer-side systems less than 1 MW. SMUD emphasizes customer service with an emphasis on transparency and predictable interconnection costs and timing.
- PG&E is a large investor-owned utility. PG&E emphasizes equitable treatment of all interconnection applicants by following all applicable rules and tariffs.
- SES develops solar photovoltaic (PV) projects of between 2-20 MWs that are generally interconnected to distribution lines offsetting local load. SES’s project cycle includes site selection, securing interconnection and land use permitting, securing contracts to sell the energy to utility customers, arranging financing, and ensuring successful construction, and project operations. It is important for SES to achieve interconnection at an economically-viable cost.
- The Clean Coalition is a non-profit organization promoting the scale-up of cost-effective renewable energy in a timely fashion. Clean Coalition highlights information transparency as a necessity to the interconnection process, especially in terms of developers locating sites that maximize energy value and minimize upgrade costs.
- IREC is a non-profit organization promoting sustainable renewable energy deployment through policy and program development at the Federal and State level. IREC publishes model rules on interconnection and is active in interconnection reform in several states, in particular those states that are not reaching higher penetrations of PV and other renewable generation.
- The CPUC regulates electric utilities and administers several programs to increase development of system-side renewable distributed. These programs include the IOU solar PV programs, the Renewable Auction Mechanism (RAM), and feed-in-tariffs (FIT).⁸ CPUC staff emphasizes the importance of aligning these programs with the interconnection process so that a generator can accurately determine its interconnection costs before it executes a power purchase agreement. The CPUC also oversees Rule 21, a state jurisdictional interconnection tariff, and the Rule 21 Working Group, which is a consensus based working group to ensure that Rule 21 remains a functional tariff as generating resources increase and the distribution system evolves.⁹

CHALLENGES

⁸ See www.cpuc.ca.gov/renewables for more information.

⁹ See <http://www.cpuc.ca.gov/PUC/energy/DistGen/rule21.htm> for more information.

There are several challenges to interconnecting DG, with different stakeholders emphasizing different aspects according to their involvement with the interconnection process.

CPUC staff, IREC, Clean Coalition, PG&E and SMUD state that Rule 21 needs to be updated.¹⁰

Specifically:

- CPUC staff and IREC state that Rule 21 is not well defined beyond the initial stages. Rule 21 functions well at providing a path to simplified interconnection for customer-side resources that primarily offset on-site load. For purposes of wholesale procurement, where generators may be ground-mounted and not located on existing structures, studies of system impacts become more complex, and Rule 21 does not contain a timeline or a process for how the IOUs should conduct studies within “Supplemental Review” or “Interconnection Study.”
- CPUC staff, IREC, and SMUD state that Rule 21 is outdated. Generating resources have multiplied and diversified, and the utility distribution system is constantly evolving. For example, one of the Rule 21 simplified interconnection screens is that a generator does not export electricity. This prevents Rule 21 from being an effective means of interconnecting wholesale generators that are intended to export power to the grid. Rule 21 should be modified to facilitate interconnection of wholesale generators given that utilities now have experience interconnecting generators through WDAT’s Fast Track process. In addition, Rule 21 needs to be updated to address larger wholesale systems in load centers that may not be associated with a single customer load.
- Clean Coalition and IREC emphasize the need to update technical standards to facilitate high penetration of DG, and maintain transparency to achieve predictable, timely, and economic development.

The Clean Coalition and IREC commented on the interaction between Rule 21 and WDAT:

¹⁰ The CPUC is in the process of updating Rule 21 through the Rule 21 Working Group and through other CPUC proceedings, as necessary. On June 15, 2011, the IOUs filed advice letters (SCE 2593-E, PG&E 3864-E, SDG&E 2262-E) to request authorization to use the procedures defined in WDAT to process Rule 21 interconnection requests. These advice letters are currently under review and available on the IOUs’ respective websites. Protests or responses to the advice letters are due on July 26, 2011.

- The Clean Coalition states that WDAT follows FERC interconnection procedures and takes control away from the State of California. According to the Clean Coalition, WDAT injects significant RPS fulfillment risk by removing California's ability to control critical interconnection rules.
- IREC states that there is general lack of clarity in California regarding which interconnection procedure to use. IREC recommends streamlining the process by requiring most generators interconnecting to the state's distribution systems to use Rule 21, in particular PURPA qualifying facilities (QFs). However, a prerequisite is Rule 21 reform, including updates to technical screens, supplemental review processes, the study process, and the queuing processes. One specific recommendation is to interconnect generators whose capacity would contribute to penetrations of no more than 50 percent of minimum load (measured when a generator is expected to be online) through expedited interconnection procedures. IREC further believes that inverter-based generators that contribute no more than 100 percent of minimum load (measured when a generator is expected to be online) should be able to interconnect through a supplemental review process without the need for a full interconnection study.

SMUD and PG&E articulate challenges specific to their interconnection experience and business. SMUD notes a need to improve communication between utility, contractor, and the customer to reduce contractor non-conformance with SMUD's interconnection standards. PG&E has had difficulty keeping up with the exponential growth in interconnection requests, which was one of the main drivers for recent changes to the CAISO Tariff and WDAT. PG&E also noted that the recent changes to the CAISO and WDAT now provide the ability for DG to participate in the Resource Adequacy program, a program requiring PG&E to contract with generators and guarantee enough capacity is available to meet PG&E's peak resource needs.

From a POU perspective, SMUD raises the following issues:

- Uncertainty about how POUs should participate in the Rule 21 Working Group
- Process for ensuring changes to Rule 21 are applicable to all POUs
- Ability of smaller POUs with smaller staffs to handle an increased volume of interconnection requests

CPUC staff states the need to align interconnection processes with the procurement mechanisms. According to CPUC staff, generators participating in RAM need to know their interconnection costs in order to accurately prepare their non-negotiable bid price. Thus, the RAM auctions need to occur after a large number of generators receive estimates of their interconnection costs. The cluster study facilitates this process since all generators that submitted interconnection requests within the application window will receive their study results at the same time. The challenge is aligning the auction with the point in the interconnection study process that will provide the generator with interconnection cost estimates that are accurate enough to inform a bid cost.

According to CPUC staff, the other challenge is the timing of the interconnection study process from start to finish. For example, if the RAM auction immediately follows the release of the Cluster 4 Phase 1 study results, it will take another two years to complete the Phase 2 studies, negotiate the interconnection agreement, and construct the necessary grid infrastructure facilities and upgrades. Thus, generators that require new infrastructure will not be able to meet the 18-month start-up deadline without an extension.

SES articulates a host of challenges based on its actual experience seeking interconnection with each of California's IOUs and in other states. First, SES states that some utilities do not work with interconnection customers in a collaborative spirit and need to improve their communications with interconnection customers and provide more information upfront about a specific interconnection request. Second, SES believes that some utilities are understaffed even though, in SES' view, they should have sufficient resources to conduct the interconnection studies since the developers pay the study fees. SES has questioned whether utilities chose not to provide adequate resources to process WDAT interconnection requests within the tariff mandated timeframe in order to:

- Create a backlog of interconnection requests that these utilities cited as evidence of the broken serial study process and rationale for studying small generators and large generators in one annual cluster study process (GIP).
- Discourage small generators from continuing with interconnection studies due to frustration with the multi-year delays and by increasing the costs of maintaining site control, which is a higher percentage of future project revenue for smaller

projects than for large projects (small projects are often located on more expensive land in more densely populated areas).

According to SES, due to the delayed processing of interconnection requests and the lack of information about site viability from some utilities, the number of interconnection requests may have increased as developers lacking any information on viability made multiple requests to maximize the chances of producing a successful interconnect request.

SES notes two other challenges from its experience with the interconnection process. One issue is that developers must bear the cost burden and uncertainty of Deliverability studies required by IOUs seeking to meet their resource adequacy requirements¹¹. Another challenge faced by SES is reconciliation of actual study costs with the study deposits that SES has made with utilities. According to SES, certain utilities have not provided reconciliation of actual study costs with study deposits made by SES for any projects since SES submitted its first interconnect request in the fall of 2009. The total deposits that SES made during this time are over \$330,000.

PROMISING SOLUTIONS

This section describes some of the best practices existing in the interconnection process as well as some of the proposed reforms.

The CPUC staff outlines three main areas to improve the interconnection process. The CPUC is already working to implement these solutions through the Rule 21 Working Group, the Renewables Portfolio Standard Proceeding (Rulemaking 11-05-005), and the Renewable Distributed Energy Collaborative (Re-DEC):¹²

- **Efficient and Effective Interconnection Study Process**
 - Establish and adhere to clear guidelines and timelines to process interconnection requests, with prompt communication when issues arise.
 - Establish and update processes to bypass or expedite the study process when generators pass a set of pre-identified screens.
- **Data Reporting and Transparency**

¹¹ See <http://www.cpuc.ca.gov/PUC/energy/Procurement/RA/> for more information.

¹² See <http://www.cpuc.ca.gov/ReDEC> for more information on Re-DEC.

- Provide public data updated monthly on the status of each interconnection request at a sufficient level of detail in order to inform the decisions of potential new interconnection requests.
- Provide the generator with information that can inform the generator's decision to apply for interconnection early in the process in order to avoid unnecessary interconnection studies.
- **Alignment of Renewable Procurement with Interconnection Processes**
 - Create a process that provides generators an incentive to utilize the existing grid infrastructure or locate generation where it benefits the system.
 - Provide information on the feasibility and costs of interconnection with enough accuracy and in time to inform renewable contract prices.

SMUD states it has an efficient interconnection process through the following practices:

- Maintaining a dedicated and experienced interconnection staff with a single customer contact for each interconnection application
- Prompt, thorough, and regular communication amongst SMUD work groups involved in the DG interconnection as well as with the interconnection applicants
- Coaching for customers on best interconnection sites and probable costs prior to their submitting applications

SMUD recommends the following process changes:

- Creation of a standing “technical mastery” group capable of quickly clarifying issues causing an impasse in specific projects, especially for smaller publicly owned utilities that may not have required technical staff on board.
- Semiannual forums in which utility staff, DG project developers, and government experts can review and attempt to resolve recurrent issues slowing interconnection across the State.
- Creation of an official interconnection blog in which interconnection issues and ambiguities can be discussed.

PG&E notes that the existing Rule 21 process works well for customer side systems sized to load requiring little if any upgrades to the utility's distribution system. For generators that export under a power purchase agreement, the latest reforms to WDAT should accommodate the fast growing volume of interconnection requests. PG&E also notes that coordinating the timing of the various CPUC procurement programs with permitting and the interconnection and transmission planning cycles could help provide generators, load-serving entities, and transmission and distribution system owners with more certainty in the form of better cost estimates on interconnection facilities, more realistic transmission and planning results, better certainty on timing of interconnection and commercial operation dates, and on the viability of generation resources. According to PG&E, aligning permitting, procurement, and interconnection will provide cost signals to the generators so that the interconnection queue is not filled with projects that are expected to be identified as unviable at some time in the future, which would help reduce the interconnection request backlog.

IREC proposes the following reforms:

- Technical review screens for “fast track” interconnection must be updated. IREC believes generators that contribute to an aggregate capacity that is below 50 percent of minimum load on a distribution circuit, measured when a generator is expected to be online, should be eligible for “fast track” interconnection. Generators with aggregate capacity 50 to 100 percent, of minimum load on a distribution circuit should interconnect through a supplemental review process without requiring a full interconnection study.
- Extend the cost waiver for distribution system upgrades that is currently in place for net-metered systems to distributed generation whose capacity addition contributes to aggregate installed capacity on a distribution feeder of less than 100 percent of minimum load on the distribution feeder.
- Distributed generation should be better integrated into distribution system planning. A number of studies have confirmed the ability of solar PV, for example, to have positive grid impacts, including the ability to reduce system loading at the distribution level during periods of high electricity demand.
- Distributed generation should be better integrated into resource adequacy planning. To the extent distributed generation is located on distribution systems and meets the 100 percent of minimum load criterion described above, it should be deemed to be fully deliverable and to provide resource adequacy benefits.

SES recommends the following to improve the interconnection process:

- Ensure existing SGIP and LGIP interconnection requests already in the queue are studied, processed, and either execute interconnection agreements or withdraw in a timely manner as the uncertainties of these incomplete interconnection requests will contribute to uncertainty in current and future cluster study results.
- Allow generators to reduce project size to improve viability based on initial GIP study results. Current rules do not allow for generators to reduce a project size.
- Improve information on interconnection viability early in interconnection request process, and throughout interconnection study process.
 - The utilities should provide maps with accurate circuit and substation capacity data.
 - The utilities should provide constructive advice on sizing projects or locating alternative Points of Interconnection.
 - The utilities should provide interconnection study results from higher queued projects.
- Reduce GIP Cluster Study timeline currently requiring more than two years from interconnection request submittal to interconnection agreement, where the cluster submittal window is only open once a year.
- The CPUC should move forward in expedited fashion on RAM program approval and the size of the RAM program, ensuring that initial procurements are not delayed.

Finally, panelists suggested other tools to aid the interconnection process:

- Interconnection maps that provide an initial look at potential costs and ability to interconnect, by showing the factors that affect interconnection, including available capacity, voltage, and presence of load.
- New software and analytics that allow more automation of the interconnection studies, model the impacts of a distribution-level interconnection on the transmission system, and help expedite the study process.

- Publicly available interconnection queues with sufficient level of detail to inform new generators about existing interconnection requests and the locations of those requests.
- An online reference tool produced by the Rule 21 Working Group, with the ability for utilities, vendors, and others to receive answers to specific questions.
- An online application and website for developers to determine status of their interconnection request. The transparency of the interconnection process and real-time updates will help reduce inefficiencies and overall cycle time.